Claims

What is claimed is

1. A planar precast construction block for transmitting a load to a support surface, the construction block comprising

   a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

      a first end with a base surface, such that the base surface transmits a load from the edge chord to the support surface,

      a second end,

      a first surface in the same plane as the first surface of the other edge chord,

      a second surface in the same plane as the second surface of the other edge chord,

      at least one surface facing away from the other edge chord, and

      at least one surface facing toward the other edge chord;

   a top support beam between the second end of the first edge chord and the second end of the second edge chord, such that the top support beam may transmit a load to the first edge chord and the second edge chord;

   at least one cross beam, such that the cross beam connects a portion of the first edge chord to the second edge chord; and

   at least one block connection means integral to the first edge chord, such that a second construction block can be attached to the first edge chord.

2. The construction block of claim 1 wherein

a cross beam is a base beam between the first end of the first edge chord and the first end of the second edge chord, such that the base beam has a surface in the same plane as the base surfaces of the first and second edge chords.

3. The construction block of claim 2 further comprising

at least one cantilevered beam extension of the base beam, such that the base beam extends past an edge chord.

4. The construction block of claim 2 further comprising

a second cross beam positioned between the base beam and the top beam; and

a substantially vertical intermediate chord positioned between the first edge chord and the second edge chord, such that the intermediate chord connects a portion of the second cross beam to a portion of the base beam.

5. The construction block of claim 1 wherein

the support surface is selected from the group consisting of a slab foundation, a pier, a plurality of piers, a footing, a plurality of footings, a construction block, a structural module, and an on-grade surface.

6. The construction block of claim 100 wherein

the top beam has at least one cantilevered beam extension, such that the top beam extends past an edge chord.

7. The construction block of claim 1 further comprising

at least two intermediate cross beams positioned between the first and second ends of the first and second edge chords, such that each intermediate cross beam connects a portion of the first edge chord to the second edge chord.

8. The construction block of claim 7 wherein

at least one intermediate cross beam has at least one cantilevered beam extension, such that the intermediate cross beam extends past an edge chord.

9. The construction block of claim 1 wherein

the second edge chord is parallel to the first edge chord; and

the top support beam is perpendicular to the first edge chord and the second edge chord, such that the construction block is a rectangular construction block.

10. The construction block of claim 1 wherein

the connection means is selected from the group consisting of sleeve connectors, keyed connectors, geometric interlocks, and hinged connectors.

11. The construction block of claim 1 wherein

the connection means is a biaxial sleeve connector.

12. The construction block of claim 11 further comprising

a first biaxial sleeve connector on the first edge chord; and

a second biaxial sleeve connector on the second edge chord.

13. The construction block of claim 12 wherein

the second biaxial sleeve connector is oriented asymmetrically with respect to the first biaxial sleeve connector.

14. The construction block of claim 12 wherein

the second biaxial sleeve connector is oriented symmetrically with respect to the first biaxial sleeve connector.

15. The construction block of claim 1 further comprising

at least one planar outward cantilevered extension from the third surface of an edge chord.

16. The construction block of claim 15 wherein

the extension is offset from the support surface.

17. The construction block of claim 1 wherein

the first edge chord comprises

a first outside edge surface facing away from the other edge chord, and

a second outside edge surface facing away from the other edge chord.

18. The construction block of claim 1 wherein

the first edge chord comprises an extension beyond the top beam.

19. The construction block of claim 1 further comprising

at least one diagonal strut positioned between the first edger chord and the second edge chord.

20. A precast construction block for transmitting a load to a support surface, the construction block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first end with a base surface, such that the base surface transmits a load from the edge chord to the support surface,

a second end,

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

at least one surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

a substantially vertical intermediate chord positioned between the first edge chord and the second edge chord; the intermediate chord comprising

a first end with a base surface, such that the base surface transmits a load from the intermediate chord to the support surface, a second end,

a first surface in the same plane as the first surfaces of the first and second edge chord;

a first top support beam between the second end of the first edge chord and the second end of the intermediate chord, such that the top support beam may transmit a load to the first edge chord and the intermediate chord;

a second top support beam between the second end of the second edge chord and the second end of the intermediate chord, such that the top support beam may transmit a load to the second edge chord and the intermediate chord;

a first cross beam, such that the first cross beam connects a portion of the first edge chord to the intermediate chord; and

at least one block connection means integral to the first edge chord such that a second construction block can be attached to the first edge chord.

21. The construction block of claim 20 wherein

the first cross beam and the second cross beam comprise a base beam between the first end of the first edge chord and the first end of the second edge chord, such that the base beam has a surface in the same plane as the base surfaces of the first and second edge chords.

22. The construction block of claim 21 further comprising

at least one cantilevered beam extension of the base beam, such that the base beam extends past an edge chord.

23. The construction block of claim 20 wherein

the support surface is selected from the group consisting of a slab foundation, a pier, a plurality of piers, a footing, a plurality of footings, a construction block, a structural module, and an on-grade surface.

24. The construction block of claim 20 wherein

the first top beam has a cantilevered beam extension, such that the first top beam extends past the first edge chord.

25. The construction block of claim 20 wherein

the second top beam has a cantilevered beam extension, such that the second top beam extends past the second edge chord.

26. The construction block of claim 20 further comprising

a second cross beam, such that the second cross beam connects a portion of the second edge chord to the intermediate chord; and

27. The construction block of claim 20 further comprising

at least one intermediate cross beam positioned between the first and second ends of the first edge chord and the intermediate chord, such that the intermediate beam connects a portion of the first edge chord to the intermediate chord.

28. The construction block of claim 27 wherein

the intermediate cross beam has at least one cantilevered beam extension, such that the intermediate beam extends past a edge chord.

29. The construction block of claim 20 wherein

the connection means is selected from the group consisting of sleeve connectors, keyed connectors, geometric interlocks, and hinged connectors.

30. The construction block of claim 20 wherein

the connection means is a biaxial sleeve connector.

31. The construction block of claim 30 further comprising

a first biaxial sleeve connector on the first edge chord; and

a second biaxial sleeve connector on the second edge chord.

32. The construction block of claim 20 further comprising

at least one planar outward cantilevered extension from the third surface of an edge chord.

33. The construction block of claim 32 wherein

the extension is offset from the support surface.

34. A connected pair of precast construction blocks, the pair comprising

a first planar precast construction block and a second planar precast construction block, each block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the third surface of the first beam of the first block is attached to the first surface of the second beam of the second block in order to create an L-shaped pair of blocks.

35. The connected pair of precast construction blocks of claim 34 wherein

the blocks are attached with threaded connectors placed through sleeves of biaxial sleeve connectors.

36. The connected pair of precast construction blocks of claim 34 further comprising

a third planar precast construction block comprising a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the second surface of the second beam of the first block is attached to the third surface of the first beam of the third block, thereby forming a ribbed wall section.

37. The connected pair of precast construction blocks of claim 34 further comprising

a third planar precast construction block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord, a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the third surface of the first beam of the second block is attached to the first surface of the second beam of the third block in order to create an open box column.

38. The connected pair of precast construction blocks of claim 34 further comprising

a fourth planar precast construction block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the third surface of the first beam of the third block is attached to the first surface of the second beam of the fourth block, and the third surface of the first beam of the fourth block is attached to the first surface of the second beam of the first block in order to create a square box column.

39. A connected pair of precast construction blocks, the pair comprising

a first planar precast construction block and a second planar precast construction block, each block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the third surface of the first beam of the first block is attached to the third surface of the first beam of the second block in order to create a planar pair of blocks.

40. The connected pair of precast construction blocks of claim 39 further comprising

a third planar precast construction block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the third surface of the second beam of the first block is attached to the third surface of the second beam of the third block, thereby forming a flat wall section.

41. The flat wall section of claim 40 further comprising

a fourth planar precast construction block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the third surface of the first beam of the fourth block is attached to the first surface of the first beam of the first block, thereby forming a pilastered wall section.

42. The connected pair of precast construction blocks of claim 40 further comprising

a plurality of other construction blocks, each block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and at least one surface facing toward the other edge chord;

at least two beams between the first edge chord and the second edge chord;

such that the first block, the second block, the third block, and the plurality of other construction blocks are each connected to at least one other block, thereby forming a general perimeter wall.

43. An asymmetric module comprising

a first planar precast construction block and a second planar precast construction block, each block comprising

a substantially upright first edge chord and a second edge chord spaced apart from the first edge chord, each edge chord comprising

a first surface in the same plane as the first surface of the other edge chord,

a second surface in the same plane as the second surface of the other edge chord,

a third surface perpendicular to the first surface and the second surface and facing away from the other edge chord, and

at least one surface facing toward the other edge chord,

an substantially vertical intermediate chord, positioned between the first edge chord and the second edge chord,

at least two beams between the first edge chord and the intermediate chord, and at least two beams between the second edge chord and the intermediate chord,

a first connection element between the first edge chord of the first block and the first edge chord of the first block; and

a second connection element between the second edge chord of the first block and the second edge chord of the first block.

44. The asymmetric module of claim 43 wherein

the first connection element is a precast construction block; and

the second connection element is a a precast construction block.

45. An asymmetric roof truss module comprising

a first planar precast construction block and a second planar precast construction block, each block comprising

a top beam,

a base beam, and

a plurality of chords between the top beam and the base beam; and

a plurality of structural connection elements between the chords of the first block and the chords of the second block.

46. A building frame comprising

a plurality of independently stable structural modules, each structural module comprising a first planar precast construction block spaced apart from a second planar precast construction block, each block comprising

a substantially upright first edge chord,

a second edge chord spaced apart from the first edge chord,

at least two beams between the first edge chord and the second edge chord;

at least one structural member connecting the first block to the second block; and

a plurality of connection members connecting each structural module to at least one other structural module.

47. The building frame of claim 46 wherein

the structural member of at least one structural module is a third block, such that the third block is attached in perpendicular orientation to the first block and to the second block, thereby forming an open-sided box column.

47. The building frame of claim 46 wherein

at least one structural module comprises a third block and a fourth block, such that the third block and the fourth block are attached in perpendicular orientation to the first block and to the second block, thereby forming a box column.

48. The building frame of claim 46 wherein

at least one structural module comprises a first block which is skewed with respect to the second block.

49. The building frame of claim 46 further comprising

a plurality of structural modules set on a support surface in a radial orientation at least partially circumscribing a center point on the support surface, wherein each structural module comprises

a first planar precast construction block spaced apart from a second planar precast construction block, each block comprising

a substantially upright first edge chord,

a second edge chord spaced apart from the first edge chord,

at least two beams between the first edge chord and the second edge chord,

a first structural member connecting the first block to the second block, and

a second structural member connecting the first block to the second block;

such that the first structural member is closer to the center point on the support surface than the second structural member, and the first structural member is narrower than the second structural member.

50. The building frame of claim 46 wherein

at least one structural module comprises a first block attached to the structural member with at least one connector means positioned through aligned sleeves provided in the first block and the structural member.

51. The building frame of claim 50 wherein

the connector means is a biaxial sleeve.

52. The building frame of claim 51 wherein

the connector means is geometric interlock

53. The building frame of claim 46 further comprising

a plurality of wall blocks supported by at least a portion of the modules.

54. The building frame of claim 53 further comprising

a plurality of floor blocks supported by at least a portion of the modules.

55. The building frame of claim 54 wherein

at least two of the modules are winged box columns which support floor blocks.

56. The building frame of claim 55 further comprising

a plurality of roof support members supported by at least a portion of the modules; and

a plurality of roof blocks supported by the roof support members.

57. A stack cast process for forming reinforced concrete construction blocks, the process comprising

pouring a first block flat on an existing casting surface by

placing a release agent on the casting surface,

temporarily securing a mold form on the casting surface, such that the block is poured in a flat orientation,

positioning reinforcement in the mold form,

supplying wet concrete to the form to cast the first block;

partially curing the first block;

removing the mold form from the first block;

pouring a second block on top of the first block by

placing a release agent on the first module,

temporarily securing a mold form on the first block, such that the second block is poured in a flat orientation,

positioning reinforcement in the mold form,

supplying wet concrete to the form to cast the second block.

58. The method of claim 57 wherein temporarily securing an open-top molding form on the casting surface further comprises

temporarily securing a first form member to the casting surface;

positioning a plurality of biaxial connection sleeves in the molding form, such that the sleeves provide passages through the block after casting;

securing a second form member at a desired distance from the first form member by

placing a threaded rod through the first form member, through a connection sleeve, and through the second form member, such that the threaded rod has a first end and a second end,

placing a temporary first restraining means on the threaded rod in proximity to the first end, and

placing a temporary second restraining means on the threaded rod in proximity to the second end, such that the first and second restraining means hold the first and second form members against the connection sleeve.

59. The method of claim 57 wherein positioning reinforcement in the molding form further comprises

positioning a plurality of biaxial connection sleeves in the molding form, such that the sleeves provide passages through the block after casting; and

securing reinforcement members to the biaxial connection sleeves.

60. The method of claim 57 further comprising

removing the second form;

lifting the second block; and

attaching the second block to the first block while the first block is on the casting surface; and

erecting the connected pair of the first block and the second block.

61. The method of claim 60 further comprising

attaching a third block to the first block while the first block is on the casting surface; and

erecting the connected first block, second block, and third block.